SPE COMPOSITES

MARCH 2015

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This Issue:

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Andrew Rich
SPE Composites
Director & Chair
Element 6 Consulting
Hanover, MA
andy@element6consulting.com

Michael Connolly
SPE Composites
Director & Chair Elect
Communications Chair
Product Manager-Urethane Composties Huntsman Polyurethanes
Auburn Hills, MI
michael_connolly@huntsman.com

Dale Brosius
SPE Composites
Director
Quickstep Composites
Dayton, OH
dbrosius@quickstepcomposites.com

Antoine Rios
SPE Composites
Director
& Secretary
The Madison Group
Madison, WI
Antoine@madisongroup.com

Jim Griffing
SPE Composites
Director & Ex-President
Technical Fellow
The Boeing Company
Seattle, WA
james.s.griffing@boeing.com

Klaus Gleich
SPE Composites
Director
Research Associate
Johns Manville Technical Center Littleton, CO
Klaus.gleich@jm.com

Creig Bowland
SPE Composites
Director & Councilor,
President, Colorado Legacy Group, LLC
Charlotte, North Carolina
Cbowland@coloradolegacy.com

Tobias Potyra
SPE Composites
Director
Manager of Operations for Composite Research @ Western University
London, ON, Canada
tobias.potyra@ict-fraunhofer.de

Pritam Das
SPE Composites Director & Newsletter Chair
Technical Manager
Toray Composites (Americans)
Tacoma, WA

Uday Vaidya, Ph.D.
SPE Composites Director & Education Chair
Professor and Director
Engineered Plastics and Composites Group
Department of Materials Science & Engineering
University of Alabama at Brimingham (UAB)
uvaidya@uab.edu

Dr. Frank Henning
Deputy Director Fraunhofer ICT
Institute of Vehicle Technology Fraunhofer ICT
Joseph-von-Fraunhoferstr. 7
76327 Pfinztal
frank.henning@ict.fraunhofer.de

Dr. Emanul Haque
SPE Composites
Director &
GE Energy Management
Plainville, CT
Enamul1.haque@ge.com

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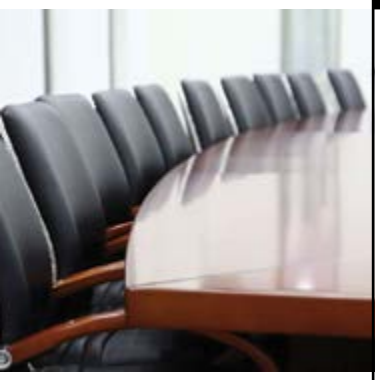

Nippani Rao
SPE Composites
Director & Inter/Intra
Societies Chair
President, RAO Associates
nippanirao@aol.com

Daniel T. Buckley
SPE Composites Director
Manager of R & D
American GFM
Shrewsbury, VT
dbuck@vermontel.net

Frederick S. Deans
SPE Composites Director
Principal
Allied Composite
Technologies, LLC
Rochester Hills, MI
fdeans@alliedcomptech.com

Dr. Nikhil Verghese
SPE Composites Director
Research Fellow
Corporate Technology
and Innovation
SABIC, Sugarland, TX
nverghese@americas.sabic.com

Aaron W. Bartel
Membership Chair & SPE
Composites Director
Materials Developer
Thermoplastic
Composites at Nike
Portland, Oregon
Aaron.Bartel@nike.com

Dale Grove
SPE Composites
Director & Awards Chair
US Silica
Senior Technology
Product Development
grove.dale@hotmail.com

Tim Johnson
SPE Composites
Director & Treasurer
Owner, President at
TJohnson LLC
Dayton, OH
TJohnsonLLC@gmail.com

Rich Caruso
SPE Composites Director
CEO Inter/Comp LLC
Falmouth, MA
rpcaruso@gmail.com

John P. Busel
SPE Composites Director,
VP, Composites
Growth Initiative
American Composites
Manufacturers
Association
Arlington, VA
busel@acmanet.org

Ray Boeman, Ph.D.
SPE Composites Director,
Dir, Energy Partnerships
Energy and
Environmental Science
Oak Ridge National
Laboratory
boemanrg@ornl.gov

This Issue:

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Awards Report

By: Dr. Dale Grove, Awards Chair

Harold Giles Award 2014/2015

The winner of the 2014 Harold Giles Award was Nicholas Brandis.

Perkin Elmer Award 2015

Three candidates have been received and we will have a final winner by 3/10/2015.

Educator of the Year Award 2015

The Composite Division Educator of the year award is due by 3/13/2015.

Honored Service Member / SPE Fellow

An application for Antoine Rios is underway.

Respectfully Submitted,
Dr. Dale Grove
Composite Division Awards Chair

Board Meeting Minutes Sept. 10th 2014

By: Antoine Rios

Monday, September 10, 2014
Location: ACCE Conference, Novi, MI

Attendees:

Andy Rich	John Busel
Dale Grove	Fred Deans
Nippani Rao	Ray Boeman
Dan Buckley	Jim Johnson
Enamul Haque	Michael Connolly
Klaus Gleich	Jim Griffing

Meeting started at 5:15pm
Chair: Andy Rich

Briefly describe changes in the Board

Number of members: The new numbers as counted by the SPE (via new software) are apparently smaller, making it look like we shrunk in numbers, but the consensus opinion was that the new numbers were more accurate, and did not double count any one single member, as some members were counted as both a former student and a current member, or with more than one company at the same time, etc.

More money: We have more of it, mainly on the success of the ACCE, which for the first time in a while didn't grow over the previous year. Still, it is a very successful conference.

More work to do: we will need to split up some of the tasks on the Board to Committees, rather than an expectation that one person could do the whole job by themselves. Inter-organizational communication was one area that could be broken up into a small group, or sub-committee, also Education, and possibly Awards. Open to discussion.

Discuss status of Awards and Education committee chair changed to Dale Grove, since Tobias was moving back to Germany. Arrangements to be made in October.

Discussion of Jackie Rehkopf scholarship, we are all in agreement as to its size and our commitment to fund half, the other half being from the Automotive division. Also, Jackie's wish was that it should go to a female researcher. However, when we came to discuss the overall size of the fund, and/or how it would be distributed/administered, all agreed this needed to be handled at a later time, in conjunction with the Automotive Division.

Discussion of the Michigan Economic Development Commission project- Turned over to Ray Boeman for an update:

Treasurer:

- Shirley Lai resigned her officer position after leaving PPG
- SPE Headquarters requires audit of the Divisions finances.
- Tim Johnson volunteered to serve as Composites Division Treasurer
- The Treasurer needs to develop a budget, submit tax filing report, and have an audit performed on the financial books.
- ACTION: Tim Johnson is to interface with Shirley to get the financial books and to set up new accounts.
- ACTION: Budget and financial statements need to be sent to the IRS if not done so already.

Awards:

- Andy Rich reported that Tobias Potyra is moving back to Germany in October and will resign as Awards Chair
- Dale Grove volunteered to take the Awards Chair post
- Jackie Rehkopf Scholarship
  It was reported that the Automotive Division allocated $10,000 to the scholarship.

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This Issue:

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Board Meeting Minutes continued...

The group discussed what was the appropriate amount to match. Dan Buckley moved to match the Automotive Division's pledge of $10,000 from the Composites Division. No discussion. Motion passed.

- Need to identify 1-2 BOD volunteers to lead the scholarship. It was suggested that ideally it should be a female member as this award will focus on female researchers
- More clarity is needed on how the Scholarship will be managed, funded and awarded
- Discuss again at next BOD, but need formal arrangement in time to implement for ACCE 2015
- Awards committee needs to be formalized
- There has been poor communications awards in the past 18 months
- The division now needs to manage a significant awards program:
  Perkin Elmer Scholarship, Harold Giles Scholarship, Sabic Educator of the Year, Jackie Rehkopf Scholarship (new), Composites Person of the Year and ACCE student awards Along with SPE Fellow and Honored Service Member (HSM) nominations
- John Busel recommends using ACMA committee activities timeline. Jim Griffing recommended checking SPE handbook to help with process of executing the awards process.
- More resources are needed
- Improved Awards committee to be formalized at next BOD meeting

Composites Division Europe:

- With three key members of the CD living in Europe (Klaus Gleich, Tobias Potyra and Frank Henning), the CD could formalize a European sub-group
- At minimum, the CD should leverage these members to improve communication and cooperation with key EU region composites entities such as JEC, EUCIA, Composites Europe, various universities, etc.
- Further discussion warranted for next BOD meeting

Inter-Intra Society Report: Nippani Rao

- ACMA Cooperation
- 2014 ACCE
- 2014 SAMPE/ACMA CAMX Show

Communications: Michael Connolly

- The BOD agreed that professional web management of the CD website will reduce BOD resource needed to maintain the website and update it in a more timely manner.
- Recommend (hourly or volunteer)
- **ACTION:** ***contact Dawn about proposal (2 weeks, 6 months)***
- It was suggested that the goal of the website be the "conduit" for users to get information

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This Issue:

Board Meeting Minutes continued...

- How to use SPE's website
- The group discussed that the communications committee needs to maintain the Linked-in group, newsletter, and blog
- **ACTION: *Investigate* SPE *requirements***

Antec 2015: Jim Griffing

- ANTEC is March 23-25 in Orlando in conjunction with NPE.
- Papers are coming in but were fewer than hoped for due to earlier deadline than usual. Deadline is likely to be extended.
- All board members are expected to help review papers and encouraged to recruit other reviewers.
- Larry Drzal and Dale Brosius have agreed to give keynote talks at division sessions.

Education

- Uday Vaidya wants to set up sub-committee on Education. Ray Boeman agreed to participate
- The CD needs to better leverage to composites educators
- One idea presented was to create a student chapter network
- Solicitation for papers at ANTEC 2015 was discussed along with judging
- Education committee along with Awards committed needs to better promote ACCE scholarships, Sabic Educator of the Year Award and other CD awards.

Open Issues

- The Board discussed the need to create a membership committee to better manage resources within the Division. No action was taken.
- The Board discussed the need for better process steps that documents what the committees do. No action was taken.

Meeting adjourned at 7:30PM

Treasury Report

By: Tim Johnson, Treasurer

SPE Composites Division (D39) FINANCIAL REPORT

Financial Report for the Period: July 1, 2014 to March 5, 2015
Section/Division Name: Composites Division D39

Balance as of 7/01/2014	-1	$96,857.91
Income: check the "Income"worksheet for details		**Actual**
Sponsorships for Newsletter	-2	$ 6,742.00
Sponsorships ANTEC Reception	-3	$ -
SPE Rebates	-4	$ -
ACCE Earnings (after expenses, scholarships and payment to SPE)	-5	$ 23,706.91
Income from TOPCON	-6	$ -
Saving Interest	-7	$ 7.27
Training programs	-8	
Perkin Elmer Award	-9	
Other	-10	
	-11	
	-12	
Total Income for the period	-13	$ 30,456.18
Total Funds Available (add lines 1 and 13)	-14	$ 127,314.09
Expense: check the "Expense" worksheet for details		**Actual**
Website - CompHelp - 1&1.com	-15	$ 321.41
Newsletter	-16	$ 5,203.00
Perkin Elmer Award	-17	$ -
BOD Meeting Expenses	-18	$ -
Educator of the Year Award	-19	$ -
Bank Service Fees	-20	$ 412.22
Antec Suite / W&C Reception	-21	$ -
ANTEC Other Expenses	-22	$ -
Council Travel	-23	$ -
Publicity	-24	$ -
SPE Scholarship Fund	-25	$ -
H. Giles Scholarship due Oct 1st	-26	$ -
Student Activities at ANTEC 2015 (SAC)	-27	$ 5,000.00
Student Membership Program	-28	$ -
UW-Madison: 2014 Summer Composites Course	-29	$ 2,500.00
ACCE expenses	-30	$ 856.52
	-31	
Total Expenses (add lines 15 – 31)	-32	$ 14,293.15
Ending Balance (subtract line 32 from line 14)	-34	$ 113,020.94
Allocation of Funds on Line 34 (enter allocations as applicable)		
Checking Account	(A)	$ 113,020.94
Savings Account 1	(B)	$ -
Savings Account 2	(C)	$ -
Investment 1	(D)	$ -
Investment 2	(E)	$ -
Investment 3	(F)	$ -
TOTAL	(G)	$ 113,020.94
Amount on line G should equal amount reported on line 34		
Section / Division Treasurer's Name:		Timothy Johnson
Audit Committee Attest:		

This Issue:

Award Winning Paper

End-To-End FE Based Homogenization Of Woven Composites

Maxime A. Melchior, Marc Duflot, Jean-Sébastien Gerard, Laurent Adam, Roger Assaker
e-Xstream engineering, an MSC Software Company

Abstract

Woven composites are represented by interlacing yarns impregnated by a resin matrix. Yarns are made of a resin matrix reinforced by continuous fibers. Homogenization of woven composites therefore requires two levels of homogenization, the one of the yarn and the one of the ply. Finite element (FE) based homogenization at the ply level can be combined with mean-field homogenization at the yarn to predict the mechanical behavior of a single ply. The main difficulty of this approach lies in the generation of representative volume element (RVE) of a single ply.

An end-to-end FE based homogenization of woven composites was developed in Digimat®. The developed set of tools allows running finite element simulations on single ply woven RVE with the use of mean-field homogenization at the yarn level. Generated RVEs are meshed with voxels to avoid meshing troubles in resin rich pockets between yarns or close to yarn crossings. The local fiber orientation used in the yarn homogenization is function of the yarn curvature. A fully analytical framework based on mean-field homogenization has also been developed. The particularity of this framework is that it takes yarn curvature into account.

The developed tools will be presented and the FE based and mean-field homogenization predictions of linear properties will be compared to experimental measurements on plain weave and 5HS woven composites

Background and Motivation

The large amount of woven designs is still found where tailor made, high-end solutions are needed and a costly solution is acceptable. The applications cover the Aerospace, Automotive (racing), Marine, wind technology and sport equipment markets. The overall objective is to use light-weight materials with the best stiffness and strength properties possible.

Woven composites are typically draped onto more or less complex surfaces to produce structural parts. The draping process can have significant impact on local warp and weft angles which leads to a local variation of effective material properties. Understanding the connection between the warp / weft microstructure, the resulting material properties and finally their influence on the part performance is crucial knowledge in the design process of woven composite structure.

A key challenge in the predictions of the woven behavior is the modeling of the mechanical behavior of a single ply. The purpose of this paper is to illustrate our ability to predict the linear behavior of single ply of woven through two different homogenization methods. This paper presents our end-to-end FE based homogenization and our mean-field homogenization for woven, braided and 2.5D woven. Comparison is made with experimental results for three different descriptions of woven.

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This Issue:

Award Winning Paper continued...

FE based homogenization of woven End-to-end solution

A complete end-to-end solution has been implemented in Digimat®. It allows performing all the different steps needed to obtain a complete FE analysis, starting from the material data available in the datasheet of the considered woven fabric. Those steps are:

- Mean-field homogenization of the yarns
- Generation of a geometry of a unit cell
- Generation of a RVE
- Voxelisation
- FE model definition and application of periodic boundary conditions
- Solving the FE analysis
- Post-processing the outputs of the FE analysis.

Generation of the geometry of woven, braided and 2.5D woven

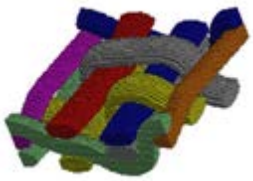
Based on the description of the woven (weave pattern, yarn cross section dimension, yarn density in the woven), a geometrical model of each yarn is built [1]. Those geometries are then assembled to create a unit cell (Figure 1). This unit cell is in turn adjusted in order to create a parallelipipedic RVE out of it. This RVE will then be meshed and used for the FE analysis.

Figure 1:Satin 5HS unit cell (left) and parallelipedic RVE (right)

Figure 2: 2.5 D Woven

Voxelisation

The geometry is discretized with a regular pattern of 8-node brick finite elements. This pattern is known as a voxel mesh (volume and pixel). Each element is assigned to the material of the phase where its center is located: either in the matrix material or in the homogenized yarn material. In the latter case, the local orientation is mapped from the geometry to the yarn element. Such a voxel mesh is illustrated on Figure 3, where the matrix elements are hidden.



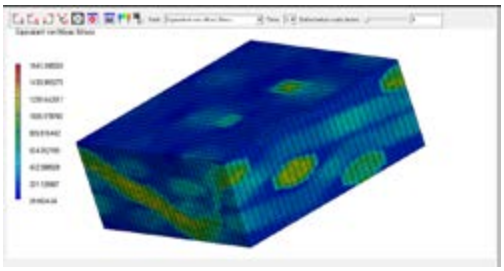


Figure 3: Voxel mesh of 2.5D woven yarn (top) and visualization of the results (bottom).

In a voxel mesh, the boundary between the matrix element set and the yarn element set is a patch of rectangular facets that are parallel to one of the RVE faces. It may then be regarded as a less accurate approximation to the RVE inner surfaces than the one that would be obtained with a usual tetrahedral mesh generator with nodes exactly on the surfaces. Still, our approach is more robust than that alternative which leads to badly-shaped tetrahedral elements in areas between yarns or close to yarn crossings.

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This Issue:

Moreover, the resulting finite element stiffness matrix has a smaller bandwidth and a better conditioning number than with a conventional mesh generator. The linear systems to be solved are well suited to iterative solvers, which we found to be particularly computationally efficient in this work. Consequently, models with small element edges, which represent the geometry sufficiently well, may be solved in a moderate CPU time.

Mean-field homogenization of woven Mean-Field Homogenization Theory

Composites are by definition a combination of two or more constituents to obtain an improved material in comparison to the base constituents. As composite properties depend on the material microstructure including fiber amount and orientation, they are adequately modeled from micromechanics. In particular, mean-field homogenization combines the properties of the underlying constituents of a multi-phase material so that the original heterogeneous material is represented by an equivalent homogeneous one. Implemented in the Digimat software [2], this technology has proven effective for a broad range of materials.

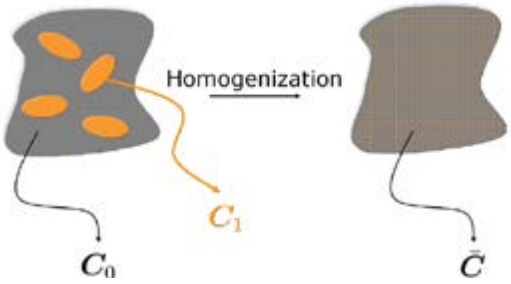

Figure 4: Heterogeneous material (left) from which its equivalent stiffness $\bar{C}$ is computed from homogenization.

Application to woven

Woven composites rely on a two-step homogenization scheme. The first step consists in the homogenization of the local behavior of the yarn. The latter is modeled as a UD composite. The second step consists in the homogenization of the ply. The latter is described as a matrix reinforced by a large number of inclusions. The orientation, volume fraction and aspect ratio of these in-

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Award Winning Paper continued...

clusions (Figure 5) are computed from the geometry and orientation of the yarn cross sections [1]. Therefore, the set of inclusions takes the yarn waviness into account. A current assumption of our model is that inclusions are represented by a spheroid instead of using an ellipsoid.

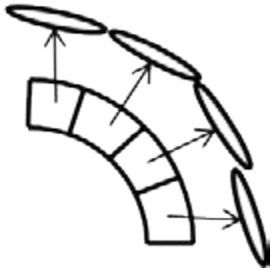

Figure 5: From the yarn cross-sections to spheroidal inclusions

Our current modeling for woven is limited to the elastic behavior.

Validation of both homogenization procedures

The FE and mean-field homogenizations of woven have been validated on three different types of woven: a balanced plain weave, an unbalanced plain weave and a 5HS satin. For each simulation 3D periodic boundary conditions and the Marc iterative solver are used.

The balanced plain weave glass/epoxy material data come from Lomov [3]. Our predictions with FE homogenization and voxel mesh and with mean field homogenization are compared to experimental data and the FE predictions with conformal mesh obtained by Lomov (Table 1). The yarn width-to-height ratio is equal to 17. The mesh consists of 50*50*20 voxels (Figure 6).

	Experimental	Lomov	Digimat-MF	Digimat-FE
E11 (GPa)	26±1.5	25.2	23.94	23.5
E22 (GPa)	26±1.5	25.2	23.94	23.2
E33 (GPa)	NA	8.55	8.54	9.14
G12 (GPa)	NA	4.5	3.1	3.82
Nu12	0.264±0.148	0.128	0.134	0.123
Nu13	NA	0.402	0.43	0.383

Table 1: Elastic constants of a balanced plain weave glass/epoxy material: experimental measurements and predictions.

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Award Winning Paper continued...

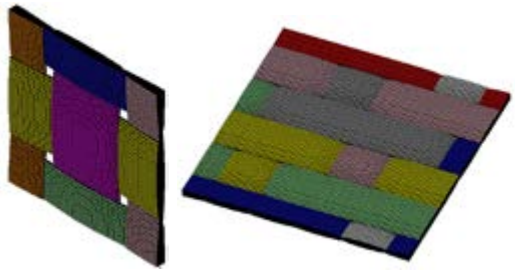

Figure 6: Voxel mesh used for the balanced plain weave glass/epoxy material and the balanced 5HS T-300 carbon/PPS material.

Predictions obtained with our two methods of homogenization are close to the experimental measurements and to the predictions of Lomov. The larger discrepancy is observed on the shear modulus predicted by mean-field homogenization. Four simulations have been required to compute these properties. They took altogether a total computation time of 88secs.

The unbalanced plain weave glass/PPS material data come from Angioni [4]. The mesh consists also of 50*50*20 voxels. The ratio between the warp and the weft width is 0.91. The yarn width-to-height ratio is equal to 19. Our predictions with FE homogenization and voxel mesh and with mean field homogenization are compared to experimental data (Table 2).

	Experimental	Digimat-MF	Digimat-FE
E11 (GPa)	24	24.8	22.5
E22 (GPa)	24	24.7	22.0
G12 (GPa)	4.7	4.6	3.97
Nu12	0.12	0.195	0.145

Table 2: Elastic constants of a unbalanced plain weave glass/PPS material: experimental measurements and predictions.

The balanced 5HS T-300 carbon/PPS material data come from Angioni [4]. The mesh consists in 100*100*20 voxels (Figure 6). The yarn width-to-height ratio is equal to 20. Our predictions with FE homogenization and voxel mesh and with mean field homogenization are compared to experimental data (Table 3).

	Experimental	Digimat-MF	Digimat-FE
E11 (GPa)	84	74.3	70.11
E22 (GPa)	84	74.3	68.52
G12 (GPa)	4.1	5.7	5.755
Nu12	0.02	0.071	0.051

Table 3: Elastic constants of a balanced 5HS T-300 carbon/PPS material: experimental measurements and predictions.

The balanced plain weave model has been used to perform a study over the computation time for the voxelisation and the iterative solver over increasing number of degree of freedom (Figure 7). Both evolve quasi linearly. Less than hundred seconds are needed to obtain results from an input file when hundred thousands of degrees of freedom are involved in the computation.

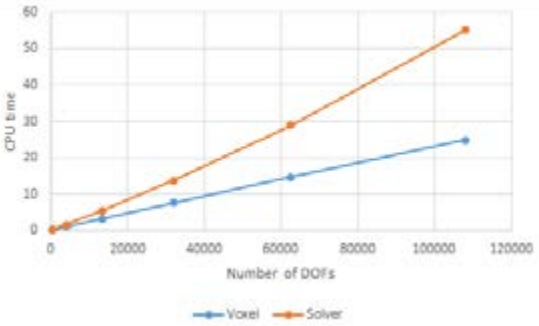

Figure 7: Evolution of the CPU time, in function of the number of degrees of freedom, for voxelisation and the iterative solver

Perspectives

Our goal for the conference presentation is to use our woven modeling in the pole side impact of a composite beam (Figure 8). Others goals are to extend our mean-field homogenization method to non-linear method and to extend our approach to orthogonal 3D woven.

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This Issue:

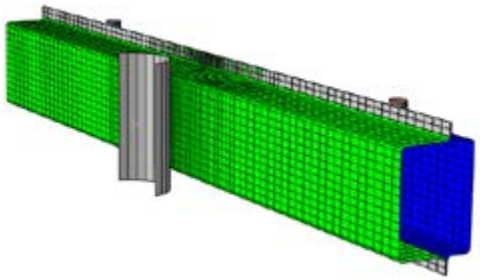

Figure 8: 3-point bending on a sub component to represent a typical pole side crash case [5].

Conclusions

Digimat® proposes an end-to end FE based homogenization of woven, braided and 2.5D woven composites. A single tool allows generating the geometry, the mesh, run the computation and post-processes the results from material data available in datasheets. The full determination of the elastic constants of a woven material can be obtained in less than 200secs when approximately hundred thousands of degrees of freedom are involved. The voxel mesh allows obtaining meshes for large width-to-height ratio of yarn cross-sections. The same material description can also be used in mean-field homogenization analysis. Predictions of elastic properties of both homogenization methods have been successfully validated against experimental measurements.

References

[1]
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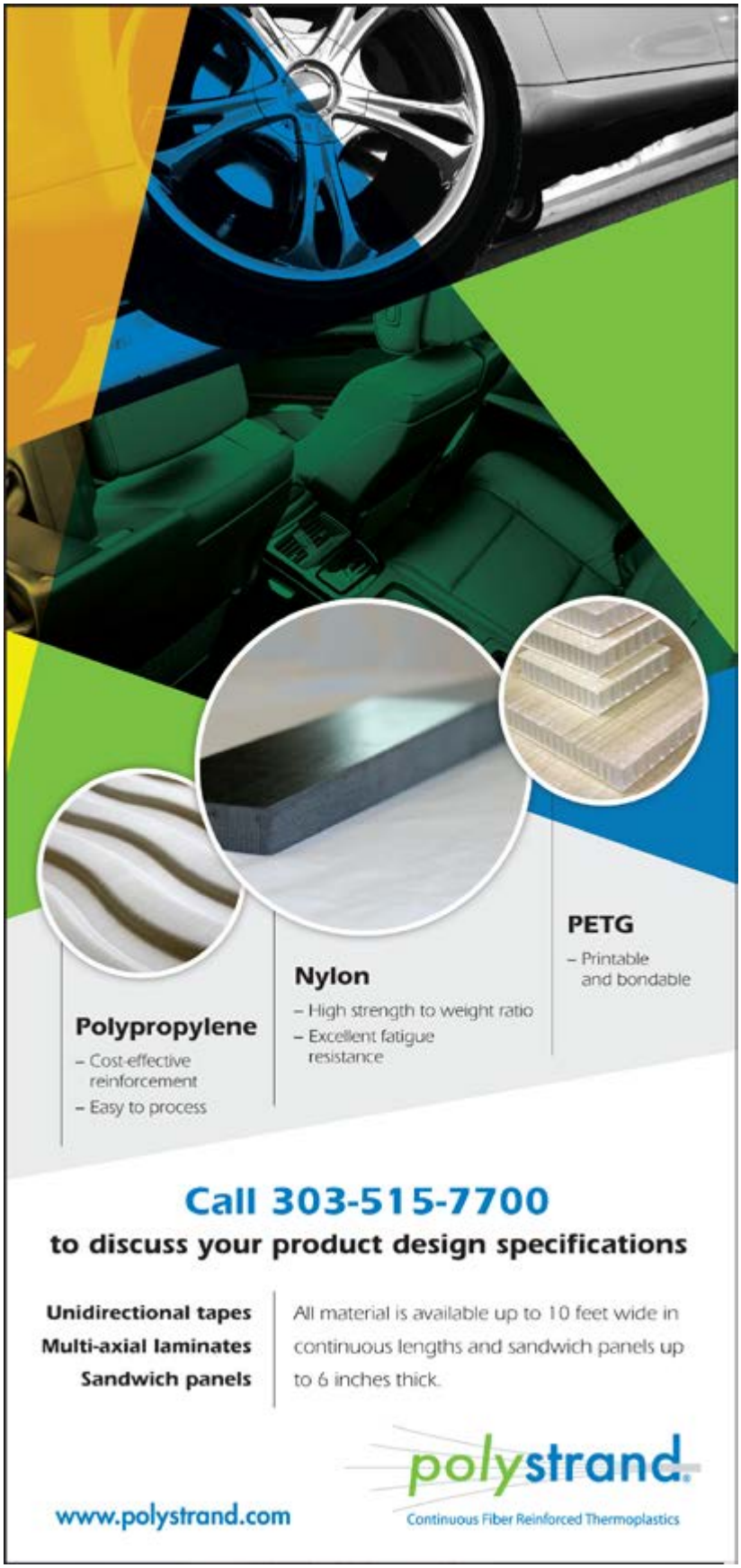
SPE Composites Division at ANTEC



Sessions for SPE Composites Division at ANTEC

Monday Morning

Nanostructures, Properties & Applications (Engineering Properties and Structures / Composites Joint Session)

Moderator
Nikhil Verghese - SABIC
Daniel Liu - Apple (EPSDIV)

M4 Room - S320B

Time: 8:30 Control# Keynote
Lawrence Drzal
The Potential for Graphene Nanoplatelets to Reinforce and Add Multifunctionality to Polymers and Composites

Time: 9:30 Control# 2109509
CHARACTERIZATION OF MELT MIXED PP COMPOSITES WITH NEW NANOSTRUCTURED CARBON MATERIALS

Time: 10:00 Control# 2139618
Reinforcement Effects in Amorphous Copolyester Nanocomposites

Time: 10:30 Control# 2086363
Manjusri Misra, Michael Snowdon
SYNTHESIS OF LIGNIN BASED CARBON PARTICLES AND THEIR PERFORMANCE AS FILLERS IN BIONANOCOMPOSITES

continued on page 18...

SPE Composites at ANTEC continued...

Monday Morning
Thermoplastic Composites I

Moderator
Antoine Rios - The Madison Group

M3 Room - S320A

Time: 8:30 Control# 2089749
Christian Groeschel
WALL THICKNESS DISTRIBUTION OF CONTINUOUS GLASS FIBER REINFORCED POLYAMIDE 6 COMPOSITE PARTS FORMED BY GAS PRESSURE

Time: 9:00 Control# 2095105
Kevin Herrington
MATRIX EFFECTS ON LONG FIBER ORIENTATION DISTRIBUTIONS WITHIN INJECTION MOLDED END-GATED PLAQUES

Time: 9:30 Control# 2135754
Suchalinee Mathurosemontri
DIRECT FIBER FEEDING INJECTION MOLDING OF GLASS FIBER REINFORCED POLYOXYMETHYLENE/POLY (LACTIC ACID) BLEND COMPOSITES

Time: 10:00 Control# 2134930
Rebecca Minnick
EFFECTS OF PROCESSING PARAMETERS ON EXPERIMENTAL FIBER ORIENTATION OF GLASS FIBER-REINFORCED INJECTION MOLDED COMPOSITES

Time: 10:30 Control# 2136131
Jason Nixon
Effect of Varaible Fiber Orientation on Material Properties in Extruded Polymer Composties with Multi-Scale Additives

Monday Afternoon
Nanocomposites I

Moderator
Enamul Haque - GE Energy Management
Jason Lyons - Arkema

M22 Room - S320A

Time: 1:30 Control# 2095740
John Quigley
Advances in Supercritical Fluid Processing of Carbon Nanotubes for Applications in Melt Compounded Polymer Nanocomposites

Time: 2:00 Control# 2097551
Erin Sullivan
Characterization of Solution Cast Exfoliated Graphite Nanoplatelet / Polylactic Acid Nanocomposite Films

Time: 2:30 Control# 2128635
Erin Sullivan
Processing and Characterization of Exfoliated Graphite Nanoplatelet and Carbon Nanotube / Polylactic Acid Nanocomposite Films

Time: 3:00 Control# 2096360
Amir Ameli
EFFECT OF PROCESS PARAMETERS ON ELECTRICAL CONDUCTIVITY OF INJECTION-MOLDED POLYPROPYLENE/MWCNT FOAMS

Time: 3:30 Control# 2137606
Patricia Okafor
NOVEL POROUS NANO-GRAPHENE/POLYIMIDE COMPOSITE AS ELECTRODE MATERIAL

continued on page 19...

This Issue:

SPE Composites at ANTEC continued...

Time: 4:00 Control# 2139469
Yasamin Kazemi Phase morphology and electrical conductivity of polypropylene/ polylactic acid blends filled with multi-walled carbon nanotubphase

Time: 4:30 Control# 2096804
Michael Czajka
Carbon Monoxide Reduced Low-Defect Graphene Nanocomposites with Poly(styrene-b-butadiene-b-styrene

Time: 5:00
Composites Division Board Meeting (5-8)

Monday Afternoon
Thermoplastic Composites II

Moderator
Creig Bowland - Colorado Legacy Group
Michael Connolly - Huntsman

M23 Room - S320B

Time: 1:30 Control# 2097453
Anne Musgrave
A STUDY OF PEEK/hBN COMPOSITES AS A COMMERCIAL MATERIAL OPTION

Time: 2:00 Control# 2138902
Eva Seidel
Evaluation of the high-powered machining Processes of fiber-reinforced Composites in relation to the Method of clamping and process design

Time: 2:30 Control# 2138978
Marcus Schuck
THERMOPLASTIC COMPOSITE LIGHTWEIGHT COMPONENTS READY FOR MASS PRODUCTION WITH NEW PROCESSES

Time: 3:00 Control# 2095327
Hongyu Chen
Long Fiber (glass) Breakage in Capillary and Contraction Flow

Time: 3:30 Control# 2139166
Ryo Takematsu
Direct Fiber Feeding Injection Molding of Glass Fiber Reinforced Polycarbonate/ABS Polymer Blends Composites

Time: 4:00 Control# 2142496
Dongjie Chen
MECHANICAL AND MORPHOLOGICAL PROPERTIES OF MICROCELLULAR POLYPROPYLENE SINGLE-POLYMER-COMPOSITES PREPARED BY MICROCELLULAR INJECTION MOLDING

Time: 4:30 2069797
Stuart Brown
High Strain Rate Testing of Glass Fiber Reinforced PEEK

Tuesday Morning
Thermoset Composites

Moderator
Klaus Gleich - Johns Manville

T3 Room - S320A

Time: 8:30
Keynote Dale Brosius
Overcoming the Barriers to Widespread Adoption of Advanced Composites

Time: 9:30 Control# 2097529
T Kuboki
Effect of Glass Fiber on Mechanical Properties of Poly(3-hydroxybutyrate-co-3-hydroxyhexanoate)
Time: 10:00 Control# 2115205
M. Fecher
Development of an additive preforming technology for RTM-parts

This Issue:

SPE Composites at ANTEC continued...

Time: 10:30 Control# 2080463
Linda Klein
AUTOMOBILE SENSORS AND FUNCTIONAL LIGHTWEIHT DESIGN – CONTRADICTIO IN ADIECTO?

Tuesday Morning
Thermoplastic Composites III

Moderator
Rich Caruso - INTER/COMP LLC

T4 Room - S320B

Time: 8:30 Control# 2095832
Mark Barger
Processing of Conductive Polymer Composite Shielding Materials

Time: 9:00 Control# 2139018
Chandra Raman BENEFITS OF SURFACE TREATMENTS & MIXED FILLER FORMULATIONS FOR THERMALLY CONDUCTIVE PLASTICS

Time: 9:30 Control# 2098191
Reza Rizvi
COMPLIANT HIGH FRICTION SURFACES ON ICE MADE USING POLYMER-FIBER COMPOSITES

Time: 10:00 Control# 2088778
Putinun Uawongsuwan
MODIFICATION OF INTERFACIAL BONDING OF HYBRID GLASS/CARBON FIBER POLYPROPYLENE COMPOSITE FABRICATED BY DIRECT FIBER FEEDING INJECTION MOLDING

Time: 10:30 Control# 2096698
Atsushi Takeda
EVALUATION OF LONG-TERM PERFORMANCE OF GFRTP FOR HOT WATER SUPPLY

Tuesday Afternoon
Nanocomposites II

Moderator
Tim Johnson - MatterWorks
Creig Bowland - Colorado Legacy Group

T20 Room - S320A

Time: 1:30 Control# 2077469
Karnik Tarverdi
PET/organoclay nanocomposites synthesized by solvent blending with sonication

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SPE Composites at ANTEC continued...

Time: 2:00 Control# 2096776
Markus Battisti
IMPROVEMENT OF MECHANICAL BEHAVIOR OF POLYPROPYLENE NANOCOMPOSITES VARYING NANOCLAYS AND COMPATIBILIZERS

Time: 2:30 Control# 2097410
Man Chio Tang
Effect of added Plasticizer on Moisture Diffusion through Polylactic Acid/Clay Nanocomposites

Time: 3:00 Control# 2091723
Kazem Majdzadeh-Ardakani
IMPROVING THE DISPERSION OF IONIC LIQUID-MODIFIED MONTMORILLONITE IN POLY(ETHYLENE TEREPHTHALATE

Time: 3:30 Control# 2139442
Shirley Peng
Properties of Crosslinked Polyurethane-Clay Nanocomposites

Time: 4:00 Control# 2091648
Craig Clemmons
COMPARISON OF COMPOUNDING APPROACHES FOR WOOD-DERIVED CELLULOSE NANOCRYSTALS AND POLYAMIDE

Time: 4:30 Control# 2094835
Lihong Geng
CRYSTAL MORPHOLOGY OF BIODEGRADABLE POLY(LACTIC ACID)/GRAPHENE OXIDE NANOCOMPOSITES AND THE ISOTHERMAL CRYSTALLIZATION KINETICS RESEARCH

Time: 5:30
Composites Division Annual Meeting and Reception (Wine and Cheese) 5:30 - 7:30

Tuesday Afternoon

Natural / Bio Composites

Moderator
Jim Thomason - The University of Strathclyde

T21 Room - S320B

Time: 1:30 Control# 2097980
Vida Poursorkhabi, M. Misra
CHARACTERIZATION OF CARBONIZED ELECTROSPUN LIGNIN FIBERS

Time: 2:00 Control# 2098080
Emmanuel Ogunsona, M. Misra
EFFECTS OF AGING ON THE FLAMMABILITY OF POLYPROPYLENE BASED BIOCOMPOSITES

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This Issue:

SPE Composites at ANTEC continued...

Time: 2:30 Control# 2097423
Shahriar Ghaffari Mosanenzadeh
Study the Effect of hBN Fibre Content and Aspect Ratio on PLA Based Composite Thermal Conductivity

Time: 3:00 Control# 2096544
Yongxu Hu
INFLUENCES OF WOOD PARTICLE SHAPE AND SURFACE MODIFICATION OF WOOD ON WOOD/PP COMPOSITES

Wednesday Morning

Nanostructures, Properties & Applications (Engineering Properties and Structures / Composites Joint Session)

Moderator
Nikhil Verghese - SABIC
David Jackson - Kimberly Clark (EPSDIV)

W4 Room - S320B

Time: 8:30 Keynote (2094178)
Gilles Lubineau
How is electrical percolation achieved in nano doped materials? Direction towards more efficient doping.

Time: 9:30 Control# 2096152
EFFECT OF ULTRASONIC TREATMENT ON ELECTRICAL AND RHEOLOGICAL PERCOLATION THRESHOLD OF POLYCARBONATE-CARBON NANOTUBES COMPOSITES

Time: 10:00 Control# 2083164
Preparation and Tube Shortening Effects of Multi-walled Carbon Nanotubes on Electrical and Mechanical properties of Polycarbonate/MWCNT Composites

Time: 10:30 Control# 2086485
IMPACTS OF DIFFERENT MECHANISMS ON CARBON NANOTUBES/ POLYMER NANOCOMPOSITES' PIEZORESISTIVITY

Wednesday Morning

Composites Analysis I

Moderator
Ryan Amundson - The Madison Group

W5 Room - S320A

Time: 8:30 Control# 2081390
Mark Cieslinski
PROGRESS IN ASSESSING FIBER ORIENTATION AND FLEXIBILITY WITH INCREASED FIBER LENGTHS

Time: 9:00 Control# 2114449
Jens van Haag
FIBER ORIENTATION PREDICTION OF LONG FIBER-REINFORCED THERMOPLASTICS: OPTIMIZATION OF MODEL PARAMETERS

Time: 9:30 2093954
Sebastian Goris
FIBER ORIENTATION MEASUREMENTS USING A NOVEL IMAGE PROCESSING ALGORITHM FOR MICRO-COMPUTED TOMOGRAPHY SCANS

Time: 10:00 Control# 2082896
Don Robbins
Nonlinear Structural Analysis of Short Fiber Filled Injection Molded Parts

Time: 10:30 Control# 2106891
Kohta Tsubaki
ULTRASONIC INSPECTION OF ARTIFICIALLY-DEFECTED GFRP

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SPE Composites at ANTEC continued...

Wednesday Afternoon

Composites Analysis II

Moderator
Uday Vaidya - University of Alabama Birmingham
Ros s Jones - The Madison Group

W20 Room - S320A

Time: 1:30 Control# 2094203
Subhransu Mohapatra
MODELING OF TENSION-COMPRESSION ASYMMETRY IN FIBER-FILLED ENGINEERING THERMOPLASTIC MATERIALS USING LS-DYNA

Time: 2:00 Control# 2132912
Peter Fey
Non-Destructive Monitoring of Damage in CFRP using Ultrasonic Birefringence

Time: 2:30 Control# 2136105
Jason Nixon
Microstructural Analysis of Multi-Scale Polymer Composites using Opitcal Microscopy and Entropic Measures

Time: 3:00 Control# 2139169
Patrick Mabry
DRAPING SIMULATION OF THERMOPLASTIC PREPREGS WITH SPECIAL FOCUS ON THE NON-LINEAR BENDING STIFFNESS

Time: 3:30 Control# 2139273
A. Ameli
UNIAXIAL STRAIN EFFECTS ON THE PERCOLATOIN THRESHOLD OF FIBERS IN POLYMER COMPOSITES: A MONTE CARLO SIMULATION

Time: 4:00 Control# 2139581
Camilo Perez
MECHANISTIC MODEL SIMULATION OF A COMPRESSION MOLDING PROCESS: FIBER ORIENTATION AND FIBER-MATRIX SEPARATION

COMPOSITES SPE®

Please Join us at the

Composites Division's Award Reception

Date: March 24th , 2015 (Tuesday)
around 5:30 PM – 7:30 PM at

Location: S320A
South Hall of the Orange County Convention Center,
Orlando, Florida USA

Call for Nominations

FIRST CALL FOR NOMINATIONS SPE COMPOSITES DIVISION

COMPOSITES EDUCATOR OF THE YEAR 2015

Submission Deadline: March 13, 2015

The **Composites Division** of the Society of Plastics Engineers is pleased to announce that it has begun accepting nominations for the **COMPOSITES EDUCATOR OF THE YEAR 2015.** The winner receives a plaque and a cheque for $750. The winner of this award will be announced at ANTEC 2015.

The **COMPOSITES EDUCATOR OF THE YEAR** is someone in the educational field (high school, university, or college-level) who has made a significant contribution to the training of students in the composites area. Examples of contributions would include the creation of new educational programs, the development of new pedagogical tools, and motivating students to enter the composite sector. It will be based on contributions made during the 2014 calendar year.

We would like you to participate by submitting: (1) the attached nomination form, (2) two letters of support for the nominee. Send the completed application to Dr. Dale Grove at grove.dale@hotmail.com **before 13 March 2015**. Judging will be done by industry members of the SPE Composite Division's Board of Directors.

SPE Composite Division Educator of the Year 2015 Application Form

Nominated educator (name, position, institution, telephone number, email address)	
Reason for nomination (250-500 words)	
Reference #1* (name, position, institution, telephone number, email address) **Each reference must write a one page letter of support explaining how the nominee has made a significant contribution to the training of students in the composites area in 2010.**	**Reference #2 (name, position, institution, telephone number, email address)** **Each reference must write a one page letter of support explaining how the nominee has made a significant contribution to the training of students in the composites area in 2010.**

* This person can also be the nominating person.

This Issue:

PerkinElmer Award Information

Application for PerkinElmer Award 2014-2015

PerkinElmer Instruments sponsors a 2-part award presented yearly by the Composites Division of the Society of Plastics Engineers. It is open to both undergraduate and graduate students. At the time of application, Master's students must be in the first year of their programme. Doctoral students must be in the first two years of their program.

The winner is selected based on a 250 word abstract describing their **composite** research. This abstract must be written by the student. The abstract is judged by a panel of industry representatives serving on the Composite Division board. The abstract is due on 13 March 2015 (see below). In the first year, the recipient receives a $1000 (USD) scholarship award and a plaque at ANTEC 2015. To be eligible for the second $1000 instalment, the research described in the winning abstract must be presented in an ANTEC 2016 paper. Procedures for submitting papers to ANTEC 2016 can be found on SPE's website www.4SPE.org.

To be considered for first 2014–2015 award, candidates must write a 250 word abstract on their research and complete the form on the next page. The abstracts and form must be emailed before 13 March, 2015 to grove.dale@hotmail.com:

This Issue:

PerkinElmer Award Application

Name:	
Program (Undergraduate/Master's/Doctoral):	
Date graduate program started:	
College or University:	
University Supervisor:	
Address:	
Phone Number:	
email:	

Please insert below your abstract of 250 words or less that describes the research

Title:

Abstract:

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